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INNOVATIVE WORK ARRANGEMENTS

A CASE STUDY IN JOB ENRICHMENT: CANADIAN INDUSTRIES LIMITED (CIL) PAINTS DIVISION, VAUGHAN CENTRE

Number 8

Ontario
Ministry of Labour

Research Branch
Toronto, Ontario

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IAN S. G. MEADOWS

RESEARCH BRANCH

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Hon. J. MacBeth
Minister

R. D. Johnston
Deputy Minister

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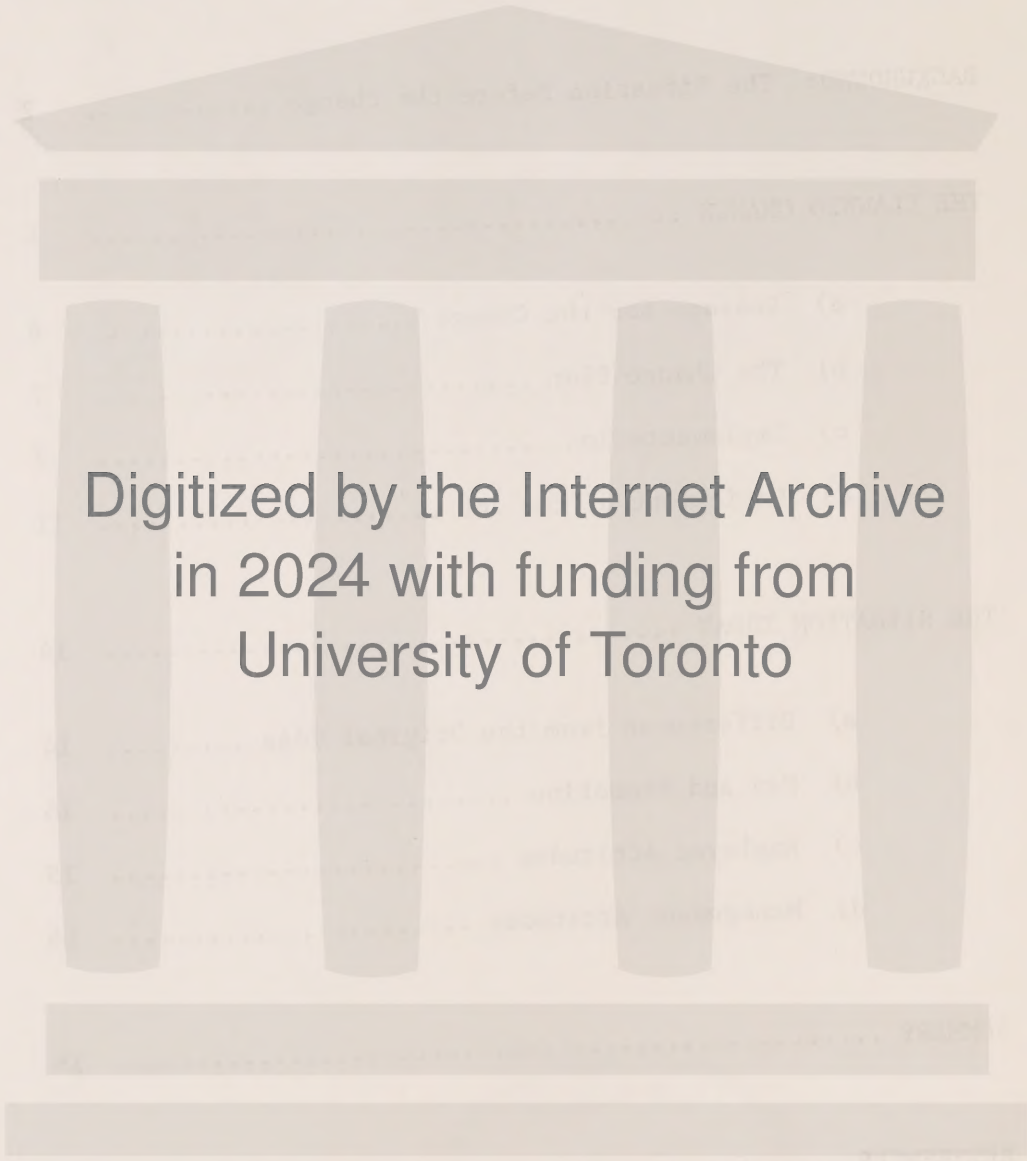

INTRODUCTION

This case study has to do with changes in the job content and the job environment of production employees in a non-unionized paint factory. These changes occurred in conjunction with important changes in technology, including the building of a new, modern plant. The technical changes, including plant location, layout, mechanization, etc., will be discussed because they help to determine the changes in job content and environment. However, while the technical issues might seem to loom larger in importance at times, it is with the human issues that we are primarily concerned.

The description of the changes that took place is presented, for convenience, in three main sections. In the first section, some background information is provided on the corporate, commercial and technical situation prior to the change. This section also describes the way in which the job of a typical production worker was organized, under the old system.

In the second section, the change itself is discussed with reference to policy, planning and implementation, and is analysed from a job-enrichment point of view.

The third section reviews the situation as it is today (1974) at the new plant, after four years of successful operation.

The case material is derived from three main sources: from personal interviews with approximately fifteen members of management, supervision and production teams; from observation of plant operations; and from the perusal of Company documents. In addition, the case-writer has been well acquainted with the firm and the industry for several years. We are very grateful to CIL, and to the individuals concerned, for making this information available to us.

BACKGROUND: THE SITUATION BEFORE THE CHANGE

CIL is a diversified Canadian chemical company with multi-national connections. The Company is divisionalized along product and market lines, each Division enjoying a high degree of operating autonomy. The Paints Division has its Head Office in Toronto, and operates four factories, two of which are in Toronto. One of the Toronto plants manufactures protective and decorative finishes for the industrial market (e.g., automotive, appliances, furniture). The other supplies the retail trade and the painting contractor with "Decorative Products", i.e., those paint products normally encountered in the hardware store or decorator supplies centre. It is with the Decorative Products manufacturing operation that this study is concerned.

CIL has a substantial share of a very competitive market for decorative paint products. The distribution patterns of the market are changing rapidly with the rise of large selling outlets for the "do-it-yourself" home builder, fixer and decorator, and the decline of the small hardware store dealer. The overall size of the market is fairly stable in the long term, but fluctuates with variations in construction activity; the production capacity of the industry is often in excess of demand. This very competitive situation, together with the advent of the large and powerful buying units, has put new and urgent strains on the manufacturing facilities of the individual paint companies. The emphasis falls increasingly on unit manufacturing costs and speed of delivery, to enable the company to bid effectively on price and service.

Until the end of 1969 CIL supplied the bulk of its share of this decorative paints market from a seventy-year old factory located in an inner residential suburb of Toronto. Throughout the 1960's Toronto Works was showing signs of obsolescence, with respect to its location, its buildings and its equipment. In consequence it was becoming increasingly difficult to cope with the new commercial demands referred to above - fast service and low cost.

Like many manufacturing processes, the making of paint involves a sequence of operations, each of which involves a different set of equipment and techniques. The conventional paint factory is, accordingly, organized into several departments, in each of which are grouped the requisite skills and equipment for a given operation.

Typical departments are:

"Grinding" - where pigment pastes are milled;
"Reducing" - where the paste is converted to a paint consistency;
"Testing" - where quality control tests are done;
"Filling" - where cans are labelled and filled with paint; and so on.

This pattern of the technical system is reflected in a corresponding pattern of specialized jobs: "grinders", "reducers", "testers" and "fillers" are typical job titles. Jobs are quite clearly defined, and employees tend to specialize in particular job areas.

The nature and scope of these jobs may be illustrated by describing a particular case, for instance a "charger-grinder" in the Grinding Department:

> The charger-grinder is given a "batch card" by his foreman or working leader and is told which equipment to use. The batch card lists the ingredients for the batch of paste to be made, the quantities to be used and some technical instructions as to the order of addition, timing, etc. The charger-grinder then proceeds to weigh out the liquid ingredients from storage tanks into a portable tank, wheels them to the grinding mill, and discharges them into the mill. The quantities are such that this is fairly heavy manual work. He must see that the mill is clean and in good order before he starts to load it. Next, he finds the pigment powders, which have been already weighed out by the Warehouse and delivered to the Grinding Department in bags. He empties the bags of pigment into the mill, and starts the mill operating. Some mills require almost constant attention to ensure effective grinding; others can be left for long periods with very little attention. At the end of a set time (specified on the batch card) the operator - i.e., the charger-grinder - takes a small sample of the ground paste (a cupful) to the laboratory and leaves it there for testing. The laboratory either pronounces the batch ready or indicates that further grinding is required. When the batch is ready the operator empties the mill into a tank, mixes in some stabilizing liquids and hands it over to the next department. He then cleans the mill, sends any portable equipment to the cleaning vats - a separate department - and goes on to the next batch.

Responsibility for assigning work, ordering materials and minor repairs, supervising maintenance, safety and housekeeping, making records and daily reports, etc., falls on the Charger-Grinder Working Leader. This is a separate job with its own specific duties and pay rate. The Working Leader is called upon to assist with the operator-duties outlined in the preceding paragraphs, but his special role is that of a co-ordinator of operations and overseer of general maintenance for a group of facilities and operators. This arrangement relieves the operators of direct responsibility in these respects.

Overall responsibility for the department, its productivity, the quality of the work done, the discipline of its members and the state of its facilities, lies with the Foreman, who takes no part in performing the actual operator-tasks.

The actual physical work a charger-grinder does consists largely of moving heavy containers of liquids across the floor, and lifting and emptying heavy bags of pigment. Those duties that require some decision are, for example, the weighing of liquids, adding ingredients in the correct order, switching mills on and off on time, watching temperature gauges and flow rates and taking samples for testing by the laboratory. The jobs performed by operators in other departments have, of course, different functions - such as cleaning, filling, reducing, testing - but are of a similar calibre and are subject to similar limitations of scope. The job of "tester", for instance, involves much less heavy physical work, and more measuring and judgment. The job of "cleaner" requires very little measuring or judgment. In each case, the operator performs a relatively narrow range of duties, closely prescribed and supervised, and is not expected to involve himself outside that narrow range.

Having to transfer materials and information frequently from one job-area to the next, and from one department to the next, can lead to delays and misunderstandings, no matter how systematically it is done. It is sometimes suggested that it would be more efficient to have a group of people do a whole series of operations for a given product, thus removing or reducing the occasion for conflict among departments. It is also suggested that this might be a more satisfying way for people to work, investing more variety and "wholeness" in their tasks.

In 1969, CIL's Toronto Works was operated in the conventional manner just described. Employees and activities were organized into functional departments and jobs were closely defined and classified. The plant was housed on three floors of an old building in which the main departments were clearly separated. There was concern about problems of high costs and difficulty in meeting delivery schedules. The technical age of the plant, its cumbersome communications and the restrictive nature of its work arrangements were thought to be important contributors to this problem.

THE PLANNED CHANGE

In 1969 the Company decided to build a new, modern plant at an industrial site outside the city, and to close the old plant down. In making this decision, a major strategic objective was to substantially improve the speed of production and to decrease unit costs. The new plant would, therefore, be designed to make the fullest possible use of high speed mechanized and automatic equipment, and the work would be organized to develop and use the human resources to their fullest potential. This would mean that some far-reaching changes would have to be made in work arrangements which were firmly entrenched in customary working practices and in the union contract.

The way in which these changes in work arrangements were conceived and put into effect is outlined in the next three sub-sections - (a), (b) and (c). This story is based on the recollections of individuals and on Company documents.

a) Reasons for the Change

At the old plant, it was customary for an employee to stay at one particular job for a substantial time. Transfer from job to job was a formal procedure; an employee could not simply switch from one operation to another without recourse to these formalities. The basic mode of operating at the old plant has been described as "lift, pull and lug", stressing the manual effort required. At the new plant the emphasis would be on the close control of equipment, materials and time, and there was to be a good deal more of "pushing buttons and watching gauges"; and if fast service was to be achieved, it would be necessary for men to move freely from one operation to another as the situation demanded. None of the jobs are so highly technical that most people cannot learn to do them all, given the opportunity.

In short, the new plant was expected to require a different orientation of the worker to his work. This difference would have to be reflected in changes in training and job design. The direction of the change would be toward greater complexity and a wider range of abilities. The Company policy on human resources was in accord with this trend. A programme of job enrichment was indicated, in which work arrangements would be changed in such a way that employees would have more variety in their work, more opportunity to participate in decisions that were within their competence to make, and more involvement in the whole process of making the product.

b) The Change Plan

A Management policy statement specific to this situation stressed the following points:

> ".. more meaningful work through job enrichment..."
> ".. development of full potential in employee ..."
> ".. greater participation by employees in establishing standards, objectives and goals ..."
> ".. involvement of all employees in problem solving ..."

These aims were translated into operating terms such as the following:

> "The team concept is an important factor in the Vaughan Centre organization. All production is handled by small teams, each team having total responsibility for production and quality in its respective area. Each team makes, fills, tests and approves all batches in its area. ... The employee as part of a small team, is now responsible for all aspects of the manufacture of a batch rather than for one small operation in its manufacture. As a result he has a much greater degree of involvement with the operation".[1]

The above statement, taken out of context, could be taken to mean that a small team of employees would see the batch through all its stages of manufacture, developing their own schedules and choosing their own methods. The batch would therefore be, in a sense, "their batch"; they would have made it, tested it, filled it into cans and given it their seal of approval. However, the technological imperatives of the case make this kind of job enrichment impossible. In order to meet the productivity and capital cost objectives for the new plant it is necessary to run the plant on three tightly scheduled shifts per day. No batch of paint can be completed through all those stages in one shift. Therefore, each batch is worked on by several successive shifts, and a given team must continually pass on unfinished batches to other teams, and work on batches that others have begun. This does not, by any means, prohibit the enrichment of the jobs, but it obviously compromises the personal involvement of employee with product.

c) Implementation

The new plant was designed to minimize the time between receiving an order and delivering the finished product. The design was based on a highly integrated system of storage tanks and

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[1] Ref. 'LOG', vol. 22, no. 4, Oct. 1970, p. 14.

fast-acting machinery for pumping, grinding, mixing and filling, selected for speed and accuracy in materials handling. To achieve its production and service goals, the new plant would have to run three shifts a day, five days a week throughout most of the year. Hourly paid employees would be required to work shifts.

The factory was built on an open plan, on one production floor with a mezzanine level. Sales management, order desk staff, laboratory staff, engineering staff and production personnel are all housed under one roof; this encourages direct face-to-face communication.

Before start up of the new plant in 1970, all production personnel transferring to the new site were asked to attend a one-month, full-time training course. The purpose of this course was:

> "To develop employee skills and knowledge in technical areas, plant processes, production and materials control, safety, equipment maintenance, communications and general business appreciation. ... (and) to stimulate our employees to develop positive attitudes towards continuing their search for knowledge and understanding in all of these areas".[1]

The courses consisted of lectures, demonstrations, practical exercises, visits to other plants and discussion sessions; in some of the latter, employees were invited to question senior managers - these sessions were known as "the hot seat".

Production employees at the new plant were organized into teams along product lines. For example, the Large Batch Emulsion team would deal with all aspects of the manufacture of large batches of emulsion paint. Each team would be led by a Co-ordinator, chosen by Management for his leadership ability and thorough knowledge of operations. The Co-ordinators differ from conventional foremen in that they are expected to share in the overall task of the team and to support, train and lead the other members, rather than to direct them and give orders. The Co-ordinator would be assisted by two or three Assistant Co-ordinators. The other members of the team are classed simply as "operators"; most production personnel are in this category. The pay structure corresponds to this simple three-level hierarchy. A typical team would consist of a Co-ordinator, two Assistant Co-ordinators and ten Operators. Since trained Operators are capable of doing many jobs, and they are all paid alike, the

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[1] Ref. 'LOG', vol. 22, no. 4, Oct. 1970.

system has great operating flexibility; the team can readily concentrate effort where it is needed, and the employees can "rotate" freely among the different jobs for training and variety.

Of course, for each product team there is a corresponding team on each of the other shifts, and each batch of product is handled by a succession of teams as it passes through the process. The shifts are organized to overlap by up to half an hour, so that Co-ordinators and other team members of the incoming and outgoing shifts have the opportunity to exchange information about the batches in progress.

The technical plant is designed to run at full capacity, with no operating "slack", and its operating procedures are strictly prescribed. Within this technical framework every effort was made to provide opportunities for employees to share in a variety of tasks and to assume responsibility in a variety of areas. However, scope for autonomous decision at either the individual or the team level is limited by the technical situation, which is quite strictly programmed. Individuals and teams can identify to some extent with product types and equipment, but this personal identification tends to be broken up by the shift system.

The nature and scope of the Operator's job can be illustrated by reference to the "job description" for an Operator engaged in Large Batch Making:

> The Operator gets a batch card from the rack; the card specifies the equipment to be used, the ingredients, quantities, and the testing and filling instructions (e.g., how many gallons, quarts, etc.). He must check that all materials, including the labels for the cans, are prepared and ready for use. He then checks his equipment (mixing tanks, grinders, etc.) and connects up the delivery line for liquid ingredients. Liquids are loaded by metering in directly from a pumping station; weights or volumes are recorded mechanically. Pigment powders are delivered, pre-weighed, in bags, and must be loaded by emptying the bags directly into the tank or mill. The operator starts the grinding equipment and makes tests for fineness as the process goes on; he adjusts flow-rates, etc., according to the results of his tests. When the tests indicate that grinding is complete, the operator pumps the product to a reducing tank, adds further liquid ingredients and mixes it mechanically to a uniform consistency. A sample must then be taken and tested for vis-

cosity, weight-per-gallon and sag resistance, using prescribed laboratory equipment and methods; further additions may be necessary to adjust quality to the required standard. Although these tests appear in the job description, it is implied that they should be done by an Assistant Co-ordinator or Co-ordinator, unless the Operator is very skilled in testing. When the Co-ordinator is satisfied with the test results he approves the batch for quality and notifies the Operator assigned to filling that it is "ready to fill".

The Operator is also expected to maintain work records, watch materials stocks, lubricate and maintain machinery, operate a straddle truck and share responsibility for safety and housekeeping in his team's area.

Comparing the schedule of duties in the new system to that of the Charger-Grinder under the old system, the operations are not very different down to the point where the grinding operation is complete. The Operator in the new system does use more sophisticated metering and pumping arrangements, requiring more care and less effort, but the grinding operations themselves are essentially the same. However, when grinding is complete, the differences become more marked. Under the old system, the Operator sends a sample to the laboratory for testing and, when approval is obtained, he discharges the mill, mixes some stabilizing ingredients with the product and turns it over to the next department. It then only remains for him to clean the mill and go on to the next batch. Under the new system, the Operator conducts the laboratory test himself, decides whether it is ready for reducing and, if so, proceeds to reduce it himself. This involves pumping to a larger "reducing" tank and metering in the requisite quantities of various liquid ingredients. At this stage the product is approaching the status of finished paint, and the Operator (or his team Co-ordinator) must carry out further "lab" tests, such as viscosity, weight-per-gallon and sag resistance. He must know how to deal with normal discrepancies in these characteristics such as, for instance, adding extra solvent to lower the viscosity to the standard level. Under the old system, these duties fall, in part, to an Operator in the Reducing department ("Reducer"), and in part to a "Tester" in the Laboratory. In addition, the Operator, under the new system, is expected to lubricate his machinery, keep records of the materials used, time spent, etc., and to keep a watch on inventory levels of the materials he uses.

Thus, there are differences in the scope of the core job (e.g., grinding, reducing), and also in the scope of the

peripheral duties (e.g., maintenance, records). The actual written job descriptions also differ in a way that reflects the new attitude: The old-system description is a one-page list of duties, mainly intended for use in connection with job "postings" under the union agreement; detailed instructions come from the foreman. The new system has a thirty-six-page description of procedural details which the Operator himself can use as a reference manual.

d) Enrichment of the Job

Job content is supposed to have several generalizable dimensions which are important to job enrichment for the employee. These are: variety; autonomy; task identity; and feedback. (See, e.g., Hackman and Lawler, 1971). The changes in work arrangements described above were intended to contribute to job enrichment. Therefore, they should be reflected in changes along some of the four dimensions. In this section, the changes described will be examined in terms of each dimension in turn.

i) Variety refers to the number of different things an employee gets to do, in the course of his normal duties. In coping with all the operations of charging, grinding, testing and reducing, and the various associated duties described above, the Operator in the new plant clearly has more variety in the things he has to do.

ii) Autonomy refers to the freedom of the employee to decide what he should do and when. In the new plant the team structure and the general supervisory climate are less authoritarian than in the old plant. However, the workflow is programmed and the technology is thoroughly prescribed; the Operator has to follow a precise recipe and sequence of operations. Therefore, there is not much opportunity for an Operator to use discretion in determining methods and schedules; there is some scope for decision and choice at the filling and packing end, such as which batch to fill first, and in what order to fill different can sizes. In general the human tasks have to accommodate themselves to the requirements of the technical system, i.e., the production schedules, the machines and the materials. It appears, therefore, that there is no more autonomy for the individual production worker in the new plant than in the old. There may even be less than in the old plant, where a certain amount of slack and lower efficiency left more room for 'ad hoc' decisions.

iii) Task identity, in the sense intended here, refers to the employee's seeing himself as involved in a coherent process which has an intelligible and useful outcome, and in which he can take some personal pride of accomplishment. The terms "wholeness" and "meaningfulness" of task are sometimes used in this connection. The new plant exposes at least some of its production workers to a wider range of activities, and there are opportunities for all Operators to observe and participate in all aspects of paint manufacture at some time or other. To this extent the new plant offers more opportunity for "task identity" than the old. The ultimate on this dimension may be where the employee, either as individual or team member, achieves a sense of "ownership" of the product of his work. However, it is unlikely that this can be achieved in a shift-work operation, where the individual or team cannot see the whole job through and feel responsibility or credit for the finished product.

iv) Feedback refers to the sending back to the employee of information concerning the outcome of his work. This information might be on the quality and quantity of his output, how it compares with the output of others, and how it rates in the opinion of fellow-workers and supervisors; or it might be on the performance of his product further on in the process, or in the hands of the ultimate user. In the new plant there is more occasion for observing the passage of the product through successive stages, and for discussing problems among team members concerned with successive stages. This is largely because many of the inter-department barriers of the old plant have been done away with.

Regular, formal "feedback" of information on performance is limited. A daily report of overall gallonage figures is sent to the Shift Supervisors, and is available to other employees if they take the trouble to look at them. Major milestones in the gradually increasing rate of output of the plant are celebrated cheerfully with "pizza and chicken for everybody"; this happens when a new thousand gallons per day record is reached. Aggregate performance figures are certainly available to all employees. However, direct feedback on performance to individuals or teams is not so evident. There is not much evidence of enrichment on this dimension.

In implementing a programme of job enrichment there are certain pitfalls, the most common of which have to do with making

a superficial change without having properly prepared the ground; (see, e.g., Tregoe, 1974). For instance, adding functions and responsibilities without adequate training will lead, in many cases, to frustration and failure. Enriching certain jobs without adjusting other related roles, such as supervisory roles, can lead to resentment and resistance. In the case we are considering, these pitfalls have been avoided through prior training and re-orientation of the employees concerned. In restructuring the entire production organization in terms of Co-ordinators, Operators, etc., some former Foremen have felt a loss of status in certain respects on becoming Co-ordinators. For instance, the Foreman used not to "get his hands dirty", as the Co-ordinator does. However, this is compensated by an enlargement in responsibility and involvement, and the problem appears not to have been a serious one.

The major obstacle to job enrichment which remains is the specific technology, to which the human tasks have usually to be accommodated. This obstacle is a common one in manufacturing industries. The economics of production imply that there is one best way to do things, and that way is adopted as the standard procedure. Any attempt to re-design jobs by changing the technology itself is likely to be a high-risk approach to job enrichment.

In the section which follows, the present situation at Vaughan Centre is examined and the changes already described are reviewed. The facts and opinions presented in this review are based on personal interviews with members of management, supervision and production teams.

THE SITUATION TODAY

In 1974, after four years of operation, the new plant (Vaughan Centre) is producing at a satisfactory level and is considerably more efficient than the old plant, in terms of productivity and speed of production. The machinery and the plant layout have been modified somewhat to improve technical performance, but no major departures from the original design have been made. On the organizational side, however, the present situation is somewhat different from the original conception.

a) Differences from the Original Idea

The formal organization of operations into product areas does clearly exist, and each is headed by a Co-ordinator; but the idea of small teams which handle all functions of the manufacturing process, and of individual operators who can handle any of these functions, appears not to have been fully realized. Three specific instances are noted below:

i) The "Filling" function appears to have regained, at least informally, the status of a department which cuts across the product-team system. In addition, individual workers tend to become specialized in certain jobs and to have little knowledge of other jobs - let alone of the overall flow of the manufacturing process. For example, a Large Batch Alkyd Filler tends to stick to filling as a job:

> "It's fairly clean work; and you get to know the machines ..."

He identifies more readily with Fillers in other product-areas than with other operators in his own area, such as Large Batch Mixers. This trend is understandable, because the Fillers are located close together and are filling paint that was often mixed on another shift by people they rarely have any contact with.

ii) The "Testing" function is done on the production floor, rather than in a separate laboratory as at the old plant. However, it tends to be the special preserve of the Co-ordinator. One Co-ordinator says that he spends the major portion of his time at the testing bench. An Assistant Co-ordinator says that his boss

> "Lets me help out a bit with the testing when he's hard pressed, but not very much".

Steps are now being taken by the staff to train Operators more widely in Testing procedures.

iii) A feature of the original arrangement at the new plant was a substantial overlap between shifts. The purpose was to allow the outgoing teams to personally hand over operations to the incoming teams, with plenty of time to discuss technical and scheduling problems, and simply to get to know one another. This does not seem to have caught on very well. One man remarked that some of the people on the other shift go into too much detail, whereas he would rather be shown very briefly just what is on the go.

b) Pay and Promotion

The pay structure is very simple, as envisaged in the original plan. After an initial period of training, approximately one year, all Operators are paid at the same hourly rate. The rate is significantly higher than the average hourly rate for the industry; Management feels this is in line with the greater amount of flexibility they require. There are no time-clocks, and pay is not docked for authorized absences. There are two higher ranks, at the working level, that an operator can aspire to: a Co-ordinator leads a team, as noted above, and is assisted by two or three Assistant Co-ordinators. These ranks are paid higher rates in line with their special responsibilities. Promotion from production work to salaried positions in the office or laboratory is encouraged and is not uncommon.

c) Employee Attitudes

The Operators and Co-ordinators talked with appear generally satisfied with their work and expressed little discontent. Neither is there much evidence of initiative or personal involvement at the Operator level. The main theme that recurs in the sentiments expressed by production workers about their jobs concerns shift work. Most, but not all, say it affects their lives adversely and they would rather not work shifts.

Four of eight production workers talked with appear to feel vaguely frustrated about participation; for instance,

> "They (management) listen to your problems and ideas and are sympathetic; but you don't get a very satisfying answer."

"It would be much better if everybody knew how to do every job ..."

"All the planning is done in the office - somewhere - I don't know ..."

The others talked with seemed to prefer being told precisely what they should do and when, and to stick to one kind of job most of the time.

d) Management Attitudes

Management executives are, of course, well aware that the current situation falls somewhat short of the original objectives with regard to participation. They express little concern at this, but feel that considerable progress has been made despite the technical difficulties and the general reluctance of any organization to depart from customary ways. They intend this progress to continue. Opportunities are offered to all employees for training and promotion and, at this stage of development, Management attaches more importance to this than to the re-design and enrichment of actual job content.

SUMMARY

The case just described is an example of a manufacturing firm applying job-enrichment principles to the work arrangements in a situation where the reigning technology is highly programmed and tightly scheduled. The physical layout and some of the work practices, such as production operators testing their own products, were designed to encourage involvement and responsibility. However, in adapting the product-team idea to a shift work system, much of the role-variety, autonomy and task "wholeness" of the job-enrichment idea has had to be foregone. For example, because the normal batch of product takes two or three shifts to complete, it is just not possible for a particular Operator to see it through from start to finish under the present system. As a result, the new "vertical" system of organization shows signs of reverting to the old "horizontal" system. On the other hand, little attempt has been made to adapt the manufacturing technology to the human requirements of the job-enrichment principles. The latter approach is, of course, a riskier and more difficult one.

Despite the compromises found necessary, the attempt is considered by no means a failure. A serious effort has been made to improve the quality and calibre of production jobs; the plant appears clean, orderly and well-run; and the attitudes of its employees are generally positive toward their work and toward the Company. Employee relations have presented no serious problem. The plant produces successfully, and operating results are a distinct improvement over those obtained at the old plant.

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